



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A61N 5/06	A1	(11) International Publication Number: WO 97/46279 (43) International Publication Date: 11 December 1997 (11.12.97)
(21) International Application Number: PCT/SE97/00977 (22) International Filing Date: 4 June 1997 (04.06.97) (30) Priority Data: 9602272-8 7 June 1996 (07.06.96) SE (71) Applicant (for all designated States except US): BIOLIGHT PATENT HOLDING AB [SE/SE]; Svärdvägen 15, S-182 33 Danderyd (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): THIBERG, Rolf [SE/SE]; Åkersbergavägen 10, S-184 50 Åkersberga (SE). (74) Agents: ÖRTENBLAD, Bertil et al.; Noréns Patentbyrå AB, P.O. Box 10198, S-100 55 Stockholm (SE).		(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> <i>In English translation (filed in Swedish).</i>
(54) Title: A DEVICE FOR EXTERNAL MEDICAL TREATMENT WITH MONOCHROMATIC LIGHT		
(57) Abstract Apparatus for external medical treatment with the aid of light, comprising a light-emitting device which is intended to lie against or be held in the close proximity of acupuncture points on the body of an individual, and drive means for driving the light-emitting device, wherein the light-emitting device includes light-emitting diodes or corresponding elements and is adapted to emit monochromatic light of a predetermined wavelength, wherein the drive means (8, 9, 10) is adapted to cause the light-emitting device (1) to emit the monochromatic light over a predetermined period of time, and wherein the drive device (8, 9, 10) is adapted to cause the light-emitting device (1) to pulsate the light in accordance with a predetermined pulse frequency. The invention is characterized in that the drive means (8, 9, 10) is adapted to cause the light-emitting device or light-emitting devices to emit the pulsating monochromatic light at a pulse repetition frequency in one of the ranges 5 Hz to 9.5 Hz, 22.2 Hz to 36.0 Hz or 273.8 Hz to 324.0 Hz.		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon		Republic of Korea	PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakhstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

**A DEVICE FOR EXTERNAL MEDICAL TREATMENT WITH
MONOCHROMATIC LIGHT**

The present invention relates to an apparatus for external
5 medical treatment with the aid of light, and then more
specifically with light that will alleviate and/or cure
different diseases, illnesses, sicknesses, etc., hereinafter
referred generally as health disorders.

10 The Swedish Patent Specification No. 502 784 teaches appa-
ratus for external medical treatment with the aid of light. The
device includes light-emitting devices which are intended to
lie against or be held in the close proximity of the body of
an individual, and means for driving the light-emitting
15 device, said light-emitting device including light-emitting
diodes or corresponding light-emitting elements. According
to this prior publication, the treatment apparatus also
includes a drive means which functions to cause the light-
emitting device to emit monochromatic light over a predeter-
20 mined period of time. The drive means is also adapted to
cause the light-emitting device to emit pulsating light in
accordance with a predetermined series of pulse frequencies.

It has been found that apparatus of this kind can be used
25 very successfully in the treatment of disorders and injuries,
for instance injuries sustained in sporting activities,
pulled or strained muscles, muscular pain, joint pains,
headaches, different inflammatory conditions, different skin
complaints, such as acne, back pains, etc., provided that the
30 light is emitted in a certain way. Treatment with light has
a favourable effect on the healing of injuries and will
alleviate and/or cure various health disorders.

Thus, it is realized that treatment with light in which a
35 certain light is emitted in a certain series of frequencies
will have a significantly greater effect with respect to

shortening the time taken to cure or alleviate a health disorder.

The present invention is based on the conception that
5 treatment corresponding to acupuncture treatment can be effected with the aid of emitted pulsating light that has a certain pulse frequency, wherein the light replaces conventional acupuncture needles.

10 The present invention thus relates to apparatus for external medical treatment with the aid of light, wherein the apparatus includes a light-emitting device which is intended to be placed against or held in the close proximity of an acupoint on the body of an individual, and a light-emitting device
15 drive means, wherein the light-emitting device includes light-emitting diodes or corresponding light-emitting elements, wherein the light-emitting device is adapted to emit monochromatic light of a predetermined wavelength, wherein the drive device is adapted to cause the light-emitting device to emit said monochromatic light over a
20 predetermined period of time, and wherein the drive device is adapted to cause the light-emitting device to emit light that pulsates in accordance with a predetermined pulse frequency. The apparatus is characterized in that the drive
25 device is operative in causing the light-emitting device or elements to emit said pulsating monochromatic light at a pulse repetition frequency in one of the ranges 5 Hz to 9.5 Hz, 22.2. Hz to 36.0 Hz or 273.8 Hz to 324.0 Hz.

30 The invention will now be described in more detail with reference to exemplifying embodiments and also with reference to the accompanying drawings, in which

- Figure 1 is a block schematic of the inventive apparatus;
- 35 - Figure 2 is a side view of a light-emitting device; and
- Figure 3 illustrates a modified construction of an inven-

Figures 1 and 2 illustrate apparatus for external medical treatment with the aid of light. The apparatus includes a light-emitting device 1, which is intended to lie against or to be held in the close proximity of the body of an individual. Figure 2 shows the light-emitting device from one side, while Figure 1 shows the element from beneath. The light-emitting device includes a housing 5 which is provided with a transparent plate 6. Located beneath the plate 6 is a surface 2 on which a plurality of light-emitting diodes 3, 4 or corresponding light-emitting elements are mounted. The light-emitting diodes send light through the plate 6 when the diodes are energized, i.e. supplied with current through a cable 7. In use, the housing 5 is held so that the plate 6 will lie against the relevant part of the body. The apparatus also includes drive means 8, 9, 10 for driving the light-emitting device 1. The light-emitting device 1 may include light-emitting diodes 3 or corresponding means for emitting infrared light. These diodes or the like are marked with solid circles in Figure 1.

The drive means 8, 9, 10 are adapted to cause the light-emitting device 1 to emit monochromatic light of a given wavelength over a predetermined time period. The drive means may also be adapted to emit monochromatic light of a wavelength different to the first-mentioned wavelength over a second predetermined time period, in an optional second stage of the treatment. Visible light is emitted with the aid of light-emitting diodes 4 or corresponding elements. These diodes are marked with hollow circles in Figure 1.

The drive means 8, 9, 10 are also adapted to cause the light-emitting device 1 to emit pulsating light in accordance with a predetermined pulse frequency or a series of pulse frequencies over predetermined time periods. The drive means include a computer 8 which functions to control drive circuits 9, 10, to which voltage is applied for driving the light-emitting

The computer and drive circuits are of an appropriate known kind. Connected to the drive means is a keyboard 13 by means of which the operator can enter drive means control data for actuating the light-emitting device in a desired manner. The apparatus will also conveniently include a display 14, on which the settings made through the keyboard are displayed.

Infrared light-emitting diodes 3 are preferably semi-conductor diodes of the GaAs kind (Gallium arsenide). The light-emitting diodes 4 that emit visible light are also preferably of the GaAs type.

For instance, the number of light-emitting diodes included in the light-emitting device may be such that the infrared light-emitting diodes will together generate a light power of 1800 milliwatts, and the diodes that emit visible light may each have a power of 3000 millicandela.

According to one embodiment of the invention, the light-emitting device 1 includes red light emitting diodes 4 that emit visible light at the wavelength of 660 nanometers and/or infrared light emitting diodes that emit light at the wavelength of 950 nanometers.

In another embodiment of the invention, the light-emitting device 1 includes light-emitting diodes 4 that emit a substantially monochromatic visible light in one of the colours violet, blue, yellow, orange, red or green.

The subject matter described above with reference to the accompanying drawings is essentially also found described in the aforementioned patent specification.

According to the invention, the drive means 8, 9, 10 are adapted to cause the light-emitting device or elements to emit said pulsating monochromatic light at a pulse repetition

frequency in one of the ranges 5 Hz to 9.5 Hz, 22.2 Hz to 36.0 Hz or 273.8 Hz to 324.0 Hz.

5 It has surprisingly been found that the inventive apparatus can be used for acupuncture treatment in a manner corresponding to acupuncture treatment with the aid of conventional acupuncture needles.

10 It has also surprisingly been found that the treatment, i.e. stimulation of the acupoints, is effected much more quickly than conventional acupuncture. Normally, each acupoint need only be treated for a period of about one minute, as compared with treatment for from about five minutes to up to an hour with conventional acupuncture. Furthermore, the patient need
15 not feel any pain.

The present invention thus represents considerable steps forward in the art. Treatment is effected in the same way as conventional acupuncture, although, with the difference, that
20 the light-emitting device is placed over the acupoint in question instead of needles, and the therapist then activates the light-emitting device such as to emit desired monochromatic light in accordance with a desired pulse repetition frequency.

25 Because the light-emitting device has a relatively large irradiating surface area, the acupoint in question can be found easily. It will be understood that the illuminating, or irradiating, surface area of the light-emitting device can
30 be adapted so that a smaller surface can be made illuminating, or irradiating, for treatment at acupoints which are relatively close together, so as to avoid treating acupoints that shall not be treated when treating a specific acupoint.

35 Three ranges of pulse repetition frequencies have been mentioned in the foregoing. The intermediate range of 22.2-

acupoints. The highest range is used for so-called weighted acupoints found on feet and hands. The lowest range is used for so-called reflex points, which are found on the ears.

5 The invention is not concerned with the question of which of the aforesaid monochromatic light shall best be used for different treatments. The wavelength of the light is chosen to give the intended treatment effect, depending on the health disorder or injury to be treated and also on which
10 acupoints shall be included in the treatment.

The drive means includes selector means of known kind with which the operator can choose a pulse repetition frequency that lies within each of said ranges. For instance, the
15 selector means may include the aforesaid keyboard by means of which desired pulse repetition frequencies are set. The chosen setting will suitably be shown in the display.

According to a preferred embodiment of the invention, the
20 light-emitting device includes at least two separate light-emitting elements 1, 15; see Figure 3. The light-emitting elements are adapted to emit monochromatic light of mutually the same wavelength. Both elements are connected to the drive means 8, 9, 10. When more than two light-emitting elements
25 are included, as indicated with the light-emitting element 16 shown in broken lines in Figure 3, all said elements are connected to the drive means. The drive means functions to cause each of the light-emitting elements to emit the monochromatic light synchronously in accordance with a
30 predetermined selected pulse frequency. This embodiment thus enables two or more acupoints to be treated simultaneously.

According to one embodiment, the light-emitting device is adapted to emit monochromatic light of different wavelengths.
35 In this case, the drive means function to cause the light-emitting device to emit solely light of one wavelength at each time point. The drive means is provided with a selector

means of known kind, for instance a selector means in which the operator can enter, and therewith select, a desired wavelength. Selected wavelengths will conveniently be shown on the display.

5

It will be apparent that the illustrated and described light-emitting device can be modified. For instance, the device may have form of a light pen that emits a light point having a diameter of, e.g., 0.5 cm to 2 cm.

10

It will be understood that the invention is not restricted to the aforescribed and illustrated exemplifying embodiments thereof and that modifications and variations can be made within the scope of the following Claims.

CLAIMS

1. Apparatus for external medical treatment with the aid of light, comprising a light-emitting device which is intended to lie against or be held in the close proximity of acupuncture points on the body of an individual, and drive means for driving the light-emitting device, wherein the light-emitting device includes light-emitting diodes or corresponding elements and is adapted to emit monochromatic light of a predetermined wavelength, wherein the drive means (8, 9, 10) is adapted to cause the light-emitting device (1) to emit said monochromatic light over a predetermined period of time, and wherein the drive device (8, 9, 10) is adapted to cause the light-emitting device (1) to pulsate said light in accordance with a predetermined pulse sequence, **characterized** in that the drive means (8, 9, 10) is adapted to cause the light-emitting device or light-emitting devices to emit said pulsating monochromatic light at a pulse repetition frequency in one of the ranges 5 Hz to 9.5 Hz, 22.2 Hz to 36.0 Hz or 273.8 Hz to 324.0 Hz.
2. Apparatus according to Claim 1, **characterized** in that the light-emitting device includes two separate light-emitting elements (1, 15); in that the two light-emitting elements (1, 15) are adapted to emit monochromatic light of the same wavelength; and in that the drive means (8, 9, 10) is adapted to cause each of the light-emitting elements to emit light synchronously in accordance with a predetermined pulse frequency.
3. Apparatus according to Claim 1 or 2, **characterized** in that the light-emitting device (1) is adapted to emit monochromatic light at different wavelengths; and in that the drive means (8, 9, 10) is adapted to cause the light-emitting device to emit solely light of one wavelength at each time point.

Fig. 1

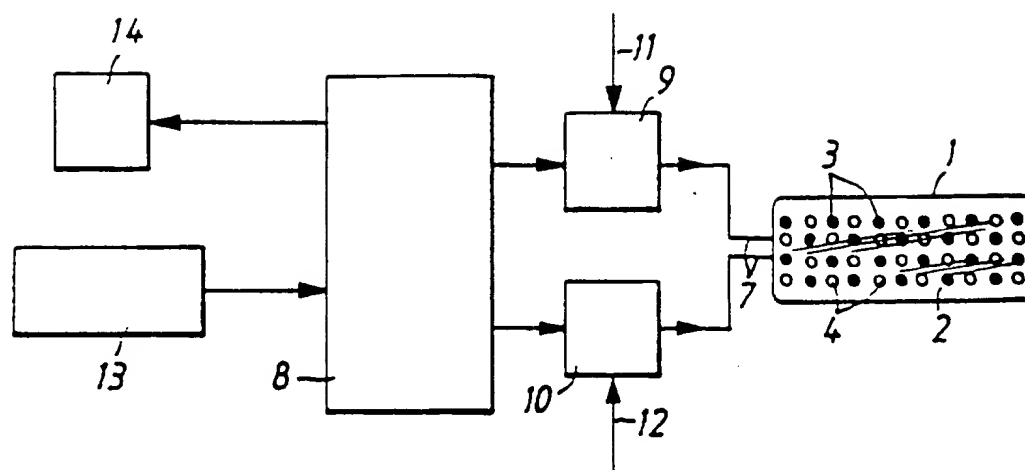
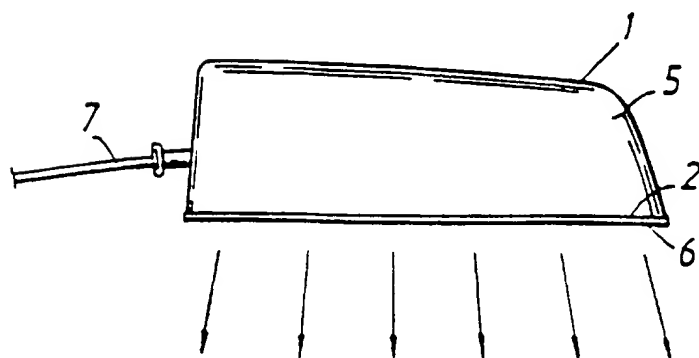
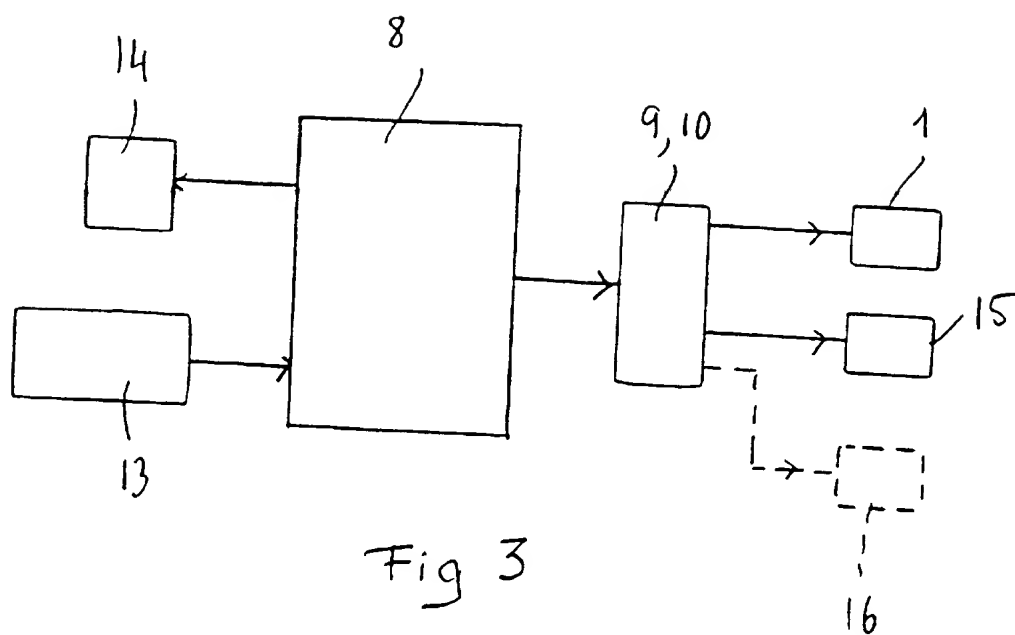


Fig. 2





INTERNATIONAL SEARCH REPORT

International application No. -

PCT/SE 97/00977

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A61N 5/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A61N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9519810 A1 (BIOLIGHT PATENT HOLDING AB), 27 July 1995 (27.07.95), see claims and pages 3-6 --	1-3
X	WO 9519809 A1 (BIOLIGHT PATENT HOLDING AB), 27 July 1995 (27.07.95), see page 4 and claims --	1-3
X	EP 0320080 A1 (DIAMANTOPOULOS, COSTAS), 14 June 1989 (14.06.89), see claims, example 6 --	1-3
X	DE 2548354 A1 (MESSERSCHMITT-BÖLKOW-BLOHM GMBH), 5 May 1977 (05.05.77), see page 10, figure 4 and claim 2 --	1-3

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

26 Sept 1997

Date of mailing of the international search report

30 -09- 1997

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM

Authorized officer

Carl-Olof Gustafsson

INTERNATIONAL SEARCH REPORT

International application No. -

PCT/SE 97/00977

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5024236 A (RONALD S. SHAPIRO), 18 June 1991 (18.06.91), see claims 1-3 and 7 --	1
X	US 5358503 A (DALE E. BERTWELL ET AL), 25 October 1994 (25.10.94), see column 5, lines 23-25 and claims --	1
X	US 5500009 A (EMANUEL MENDES ET AL), 19 March 1996 (19.03.96), see column 2-3 --	1
X	GB 2212010 A (AMCOR LTD), 12 July 1989 (12.07.89), see page 5, lines 25-34, page 7, lines 3-14, page 8, lines 19-35 --	1
X	DE 3134953 A1 (SCHMID, GEB.BÜHL, ANNEMARIE), 10 March 1983 (10.03.83), see claim 2 and page 3, lines 22-25 --	1
A	US 5259380 A (EMANUEL MENDES ET AL), 9 November 1993 (09.11.93), see claims 11 and column 5 --	1,3
A	WO 9118646 A1 (OMEGA UNIVERSAL HOLDINGS LIMITED), 12 December 1991 (12.12.91), see figure 2, pages 7-8 and claim 3 --	1
A	Lasers in Surgery and Medicine, Volume 17, 1995, Basim Mokhtar et al, "Double-Blind, Placebo-Controlled Investigation of the Effect of Combined Phototherapy/Low Intensity Laser Therapy Upon Experimental Ischaemic Pain in Humans" page 74 - page 81 -- -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

01/09/97

International application No. -

PCT/SE 97/00977

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
WO	9519810	A1	27/07/95	AU	1549495 A	08/08/95
				AU	1549595 A	08/08/95
				AU	6160094 A	14/09/94
				BR	9406091 A	12/12/95
				CA	2181345 A	27/07/95
				CA	2181346 A	27/07/95
				CN	1138830 A	25/12/96
				CN	1138831 A	25/12/96
				EP	0686145 A	13/12/95
				EP	0740567 A	06/11/96
				EP	0740568 A	06/11/96
				FI	954017 A	25/08/95
				JP	8509468 T	08/10/96
				NO	953333 A	24/08/95
				PL	310399 A	11/12/95
				SE	502784 C	15/01/96
				SE	504298 C	23/12/96
				SE	9400153 A	21/07/95
				SE	9402679 A	21/07/95
				SK	97095 A	01/10/96
				WO	9519809 A	27/07/95
WO	9519809	A1	27/07/95	AU	1549495 A	08/08/95
				AU	1549595 A	08/08/95
				AU	6160094 A	14/09/94
				BR	9406091 A	12/12/95
				CA	2181345 A	27/07/95
				CA	2181346 A	27/07/95
				CN	1138830 A	25/12/96
				CN	1138831 A	25/12/96
				EP	0686145 A	13/12/95
				EP	0740567 A	06/11/96
				EP	0740568 A	06/11/96
				FI	954017 A	25/08/95
				JP	8509468 T	08/10/96
				NO	953333 A	24/08/95
				PL	310399 A	11/12/95
				SE	502784 C	15/01/96
				SE	504298 C	23/12/96
				SE	9400153 A	21/07/95
				SE	9402679 A	21/07/95
				SK	97095 A	01/10/96
				WO	9519810 A	27/07/95
EP	0320080	A1	14/06/89	CA	1329416 A	10/05/94
				DE	3882933 A	09/09/93
				IN	167659 A	01/12/90
				JP	1136668 A	29/05/89
				US	4930504 A	05/06/90
DE	2548354	A1	05/05/77	FR	2329258 A,B	27/05/77
US	5024236	A	18/06/91	NONE		

INTERNATIONAL SEARCH REPORT

Information on patent family members

01/09/97

International application No. -

PCT/SE 97/00977

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
US	5358503	A	25/10/94	CA	2181467 A	27/07/95
				EP	0741594 A	13/11/96
				WO	9519812 A	27/07/95
US	5500009	A	19/03/96	CA	2120457 A	28/03/95
				US	5259380 A	09/11/93
				US	5549660 A	27/08/96
GB	2212010	A	12/07/89	IL	84367 A	27/02/94
				IL	102125 A	15/04/97
DE	3134953	A1	10/03/83	NONE		
US	5259380	A	09/11/93	US	5500009 A	19/03/96
				US	5549660 A	27/08/96
WO	9118646	A1	12/12/91	EP	0485570 A	20/05/92